REMARKS

Claims 1, 3, 6, and 8 are currently pending in the application. Claims 2, 4, 5, 7, 9, and 10 were canceled by previous amendment.

Claims 3 and 8 have been amended. The term "mixer" used in the amended claims is described throughout the application ("mixer 810"), for example, on page 11, lines 13, 16, and 22, and page 14, lines 5 – 11, etc. No new matter is added.

Claim 1 is rejected under 35 U.S.C. §102(b) over U.S. Patent No. 5,808,463 to Nagano (hereinafter, "Nagano"). Claims 3, 6, and 8 are rejected under 35 U.S.C. §103(a) over: Nagano in view of U.S. Patent No. 5,856,796 to Akune (hereinafter, "Akune"); over Nagano in view of U.S. Patent No. 4,888,701 to Wakasugi, et al. (hereinafter, "Wakasugi"); or over Nagano in view of Akune and further in view of Wakasugi.

Independent claim 1 recites, in part, "A vector-detecting apparatus…comprising:

a first filter; and

a second filter whose impulse response is orthogonal to said first filter,

wherein an <u>output of said first filter is regarded as the in-phase component of said pre-determined frequency signal</u>, and <u>output of said second filter is regarded as the quadrature-phase component of said pre-determined frequency signal</u>,

wherein an <u>impulse response of said first filter is weighted by a sine function of the frequency of the pre-determined frequency signal</u> and an <u>impulse response of said second filter is weighted by a cosine function of the frequency of the pre-determined frequency signal</u>,

wherein <u>said first filter is a single filter that has an impulse response weighted by a sine function of the frequency of the pre-determined frequency signal</u> and <u>said second filter is a single filter that has an impulse response weighted by a cosine function of the frequency of the pre-determined frequency signal</u>…" [emphasis added]

Applicant respectfully submits that Nagano fails to disclose or suggest a first filter where the "impulse response is weighted by a sine function…," nor a second filter having an "impulse

response weighted by a cosine function" as recited in claim 1 (and further described in the application as filters 860 and 865, see Figs. 3A, 3B, and corresponding descriptions).

The Office Action states that Nagano discloses "…wherein said first and second filters filter the output signal of said frequency converter," and so appears to equate Nagano's filters 405 and 406 (see Fig. 4, and description at col. 5, lines 33 – 39 and 62 – 64) with the present application's first filter 860 and second filter 865. Also, the Office Action states that "the response of said first filter is weighted by a sine function" and "the impulse response of said second filter is weighted by the cosine function" (Office Action at bottom of page 2 and top of page 3). The "impulse response" of a filter, as used in the application, is the output from the filter when presented with a brief signal, i.e., an impulse.

However, Nagano clearly discloses digital filters 405 and 406 that have weighted <u>input</u> signals to filters 405 and 406. Nagano's filters 405 and 406 do <u>not</u> have impulse responses that are weighted by a sine function or a cosine function, respectively, of the same frequency of the same signal under test.

Moreover, Nagano fails to disclose or suggest that the first filter is a <u>single filter</u> having an impulse response weighted by a sine function of the frequency of the pre-determined frequency signal and a second filter that is a <u>single filter</u> having an impulse response weighted by a cosine function of the frequency of the pre-determined frequency signal. Instead, Nagano requires signal generators 402 and 404 and multipliers 401 and 403 (col. 5, lines 53–54, 57–60).

Therefore, filters 405 and 406 disclosed in Nagano are *not* the same filters as the first filter and second filters recited in claim 1, either in terms of operation or function.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection under §102(b) over Nagano to claim 1.

Claim 3 is rejected under §103(a) over Nagano, in view of Akune.

Claim 3, as amended, recites in part, "A vector-detecting apparatus...comprising:

a mixer for converting said pre-determined frequency signal to a signal under test;

a first filter; and

a second filter,

wherein said <u>first and second filters filter an output signal of said mixer</u> and whose impulse responses are orthogonal to each other,

wherein an output of said first filter is regarded as the in-phase component of said signal under test, and an output of said second filter is regarded as the quadrature-phase component of said signal under test,

wherein an <u>impulse response of said first filter is weighted by a sine function</u> of the frequency of said signal under test after frequency conversion by said mixer, and <u>an impulse response of said second filter is weighted by a cosine function</u> of the frequency of the signal under test after frequency conversion by the mixer,

wherein said first filter and said second filter are digital filters,

wherein a <u>ratio of the frequency of said pre-determined frequency signal and said signal under test is an integer of 2 or higher</u>, and

wherein a <u>ratio of the frequency of a local signal inputted into said mixer and said signal under test is an integer of 3 or higher</u>." [emphasis added].

Applicant submits that Nagano does not disclose or suggest the particular <u>ratio</u> conditions recited in claim 3. Such ratio conditions are important to the operation of an apparatus where the first filter and the second filter operate by filtering an output signal from the mixer.

The first filter and the second filter in the application have a comb-shaped frequency response, because the first filter and second filter have <u>sine-weighted</u> and <u>cosine-weighted impulse responses</u>, respectively. If the ratio condition recited in claim 3 is satisfied, then undesired signals are located around the "dips" of the comb, as shown in figures 5 and 6 of the application. Thus, pass-bandwidth of anti-alias filter 830 can be set much wider than in the cited art. On the other hand, Nagano uses decimation filters for rate-conversion of over-sampled

signals, in order not to output "spurious" signals. Even if the decimation filters are poor, the aliasing spurious information included in the output signals from the decimation filters does not match to undesired signals that are output from the mixer. The integer ratio of decimation is only for producing digital signals at the required rate.

Nagano merely provides that "[i]n the present embodiment, the transmitting channel may be present in any of frequency regions. However, it will be most typical in several ten MHz to several ten GHz" and "$f_H = f_{IP}/4$" (col. 5, lines 22-24 and col. 8, line 19), where f_H is defined as the cosine and sine signals having the same frequency (col. 5, lines 56-57) and f_{IP} is defined as a frequency that is the same as the sampling frequency (col. 8, lines 13-14). Nagano does not disclose or suggest a ratio of the frequency of the pre-determined frequency signal and the signal under test that is <u>an integer of 2 or higher</u>, let alone a ratio of the frequency of a local signal inputted into the frequency converter and the signal under test that is <u>an integer of 3 or higher</u>.

Nagano's disclosure does not even suggest the <u>integer ratios</u> of claim 3, without recognizing the comb-shaped response of the first filter and the second filter as well as the spectrum of signals from the mixer. Akune does not supplement the deficiency in Nagano to provide for the integer ratios recited in claim 3, nor would it have been obvious for the skilled practitioner, without benefit of hindsight, to have picked out an integer ratio from the secondary reference and combine it with Nagano so as to arrive at the features of claim 3.

Thus, Nagano fails to disclose or suggest the features of claim 3, either alone, or in combination with Akune. Accordingly, for the reasons above, Applicant respectfully requests reconsideration and withdrawal of the rejection to claim 3 brought under §103(a).

Claim 6 is rejected under 35 U.S.C. §103(a) over Nagano in view of Wakasugi.

Claim 6 recites, in part, "An impedance measuring apparatus...

...a first filter and a second filter whose impulse responses are orthogonal to each other;

...wherein said <u>first filter is a single filter that has an impulse response weighted by a sine function</u> of the frequency of the pre-determined frequency signal and <u>said second filter is a single</u>

filter that has an impulse response weighted by a cosine function of the frequency of the pre-determined frequency signal..." [emphasis added].

Applicant respectfully submits that Nagano fails to disclose or suggest a first filter having an "impulse response weighted by a sine function...," nor a second filter having an "impulse response weighted by a cosine function" as recited in claim 6.

As in the discussion of claim 1, above, the Office Action appears to be equating Nagano's filters 405 and 406 with the present application's first filter 860 and second filter 865. Also, the Office Action states that "the response of said first filter is weighted by a sine function" and "the impulse response of said second filter is weighted by the cosine function" (Office Action at bottom of page 2 and top of page 3), where the "impulse response" of a filter, as used in the application, is the output from the filter when presented with a brief signal (an "impulse").

However, Nagano clearly discloses digital filters 405 and 406 that have weighted input signals – not impulse responses - that are weighted by a sine function or a cosine function of the same frequency of the same signal under test. Moreover, Nagano fails to disclose or suggest that the first filter is a single filter having an impulse response weighted by a sine function of the frequency of the pre-determined frequency signal, and a second filter that is a single filter having an impulse response weighted by a cosine function of the frequency of the pre-determined frequency signal. Therefore, filters 405 and 406 disclosed in Nagano are *not* the same filters as the first filter and second filters recited in claim 6. Nagano therefore fails to disclose or suggest these features of claim 6.

The secondary reference, Wakasugi, provides an apparatus for projections of signals supplied to two inputs on mutually perpendicular axes by applying a different combination of the signals respectively at the input terminals and quadrature phases of an AC wave to each of four phase detectors or by applying each combination in sequence to each phase detector. However, Wakasugi fails to supplement the missing elements in Nagano regarding the function and operation of the first filter and second filter recited in claim 6, described in detail above.

Thus, Nagano, taken alone or in combination with Wakasugi, does not disclose or suggest all of the features in claim 6, and does not render the claim obvious.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection under §103(a) over Nagano in view of Wakasugi to claim 6.

Claim 8 is rejected under 35 U.S.C. §103(a) over Nagano in view of Akune and further in view of Wakasugi.

Claim 8, as amended, recites in part, "An impedance measuring apparatus…comprising:

a mixer;

a first filter; and

a second filter, wherein said first and second filters are capable of filtering an output signal of said mixer and whose impulse responses are orthogonal to each other,

wherein an output of said first filter is regarded as the in-phase component of said pre-determined frequency signal, and an output of said second filter is regarded as the quadrature-phase component of said pre-determined frequency signal,

wherein the impulse response of said first filter is weighted by a sine function of the frequency of the pre-determined frequency signal after frequency conversion by said mixer and the impulse response of said second filter is weighted by a cosine function of the frequency of the pre-determined frequency signal after frequency conversion by said mixer,

wherein said first filter and said second filter are digital filters,

wherein a ratio of the frequency of said pre-determined frequency signal and said signal under test is an integer of 2 or higher, and

wherein a ratio of the frequency of a local signal inputted into said mixer and said signal under test is an integer of 3 or higher." [emphasis added].

As to claim 8, Applicant submits that Nagano does not disclose or suggest the particular ratio conditions that are recited. As noted in the discussion for claim 3, above, the ratio conditions are important to the operation of an apparatus where the first filter and the second filter operate by filtering an output signal from the mixer.

In the present application, the ratio conditions are important because the first filter and the second filter in the application have a comb-shaped frequency response (since the first filter and second filter have sine-weighted and cosine-weighted impulse responses, respectively). If the ratio conditions recited in claim 8 are satisfied, any undesired signals are located around the "dips" of the comb (Figs. 5 and 6 of the application). The pass-bandwidth of the filter 830 can be set much wider than in the cited art. As was noted earlier, Nagano discloses decimation filters for rate-conversion of over-sampled signals, in order not to output spurious signals. Even if the decimation filters are poor, the aliasing spurious information included in the output signals from the decimation filters does not match to undesired signals that are output from the mixer. The integer ratio of decimation is only for producing digital signals at the required rate.

Nagano merely provides that "[i]n the present embodiment, the transmitting channel may be present in any of frequency regions. However, it will be most typical in several ten MHz to several ten GHz" and "$f_H = f_{IP}/4$" (col. 5, lines 22-24 and col. 8, line 19), where f_H is defined as the cosine and sine signals having the same frequency (col. 5, lines 56-57) and f_{IP} is defined as a frequency that is the same as the sampling frequency (col. 8, lines 13-14). Nagano does not disclose or suggest a ratio of the frequency of the pre-determined frequency signal and the signal under test that is an integer of 2 or higher, let alone a ratio of the frequency of a local signal inputted into the frequency converter and the signal under test that is an integer of 3 or higher.

Thus, Nagano's disclosure does not suggest the integer ratios of claim 8, without recognizing the comb-shaped response of the first filter and the second filter as well as the spectrum of signals from the mixer. Neither one of the two secondary references, Akune and Wakasugi, provides a disclosure that supplements these particular deficiencies in Nagano to provide for the integer ratios recited in claim 8, nor would it have been obvious for the skilled practitioner to have picked out an integer ratio from either of the secondary references to combine with Nagano to arrive at the features of claim 8, without benefit of hindsight.

Thus, Nagano, when taken alone or in combination with Akune and/or Wakasugi, does not disclose or suggest all of the features in claim 8, and does not render the claim obvious.

Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejection to claim 8 under §103(a) over Nagano, in view of Akune, and further in view of Wakasugi.

Based on the amendments and the discussion provided above, Applicant submits that the rejections brought to claims 1, 3, 6, and 8, have been overcome. Accordingly, Applicant respectfully requests reconsideration and withdrawal of the rejections brought in the Office Action, and passage of claims 1, 3, 6, and 8 to allowance.

Respectfully submitted,

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